

THE JOURNAL OF TROPICAL MEDICINE

1903, 6, 254-256

WELLCOME INSTITUTE LIBRARY	
Coll.	weTROmec
Call	par
No.	WC 530
	1903
	B 214

YELLOW FEVER AND MOSQUITOES.

A Critical Note by Dr. Ivo BANDI.

*The Bacteriological Institute of the State of Sao Paulo,
Brazil.*

IN addition to the many epidemiological observations which oppose the theory of the propagation of yellow fever through the agency of *Stegomyia fasciata*, there are some interesting accounts, relating to the feeding habits of this *Culex*, which also appear to contradict the newly advanced hypothesis.

Stegomyia fasciata is a diurnal mosquito, and this



22200059572

fact has been confirmed by careful observations recently made in many localities.

Theobald, for instance, in his work "A Monograph of the Culicidæ in the World," writes as follows: "Regarding *Stegomyia fasciata*, Dr. St. George Gray says that *Stegomyia fasciata*, one of the most annoying and widespread mosquitoes, is a most vicious biter in the early afternoon, from about 1 to 3 p.m." And in addition to this: "Night is the time when both *Culex* and *Anopheles* cause most annoyance, from an hour or so before sunset to a short time after sunrise. But protection during those hours will not entirely save us from their annoyance, because certain species bite at other times, as for instance, the world-wide *Stegomyia fasciata* and the European *Culex dorsalis*."

Dr. Durham also, in his "Report of the Yellow Fever Expedition to Para," published in the Thompson Yates Laboratory Reports, vol. iv., part 2, May, 1902, expresses himself as follows in regard to this subject: "This species (*i.e.*, *Stegomyia fasciata*) in Para is solely a day-gnat; it consequently afforded means of observations. It is on the wing and will bite shortly after sunrise, about 6 a.m.: again a few have been observed biting about 8 to 9 a.m., after which there is a pause till about 11 a.m., when again a few may be feeding." The time of chief activity is in the middle of the day, from about 12 to 2 p.m. They then bite freely and are seen to copulate on the wing in numbers; another pause follows, though there may be a few about, but they do not cause trouble when one is sitting at the microscope from about 3.30 till about 5 p.m. After dusk I have only once met with a specimen; this was a male feeding from a sugar-basin, rather before 7 p.m.¹

Ficalbi, in his work, "Venti specie di zanzare (Culicide) italiana, classate, descritte, &c.," makes the following observations in the chapter on the dietary of the *Culicidæ*: "As regards the fully-developed insect, I beg to reiterate that no mosquito, even though it swarm in the daytime, likes a bright light or rays of the sun; nevertheless, there are mosquitoes, such as the *Culex elegans* (*Stegomyia fasciata*) that are exclusively diurnal in their habits; the greater number of the species, however, are nocturnal or crepuscular."

In addition he remarks: "*Culex elegans* has many interesting dietetic characteristics. Being a diurnal mosquito, it is very worrying to any one sitting at a table studying or working at the microscope."

In the course of a lecture on the mosquito and malaria in connection with *Stegomyia fasciata*, Dr. Thompson makes the following observation: "And we have the appropriate *Culex* ready to carry it (yellow fever) from

man to man, a mosquito which from its day-feeding habit is more difficult to reckon with than *Anopheles*."

Dr. Lutz terms the *Stegomyia fasciata* the "spotted day-mosquito," and Finlay also states that the *Culex* (*Stegomyia fasciata*) in Havana is a day-feeding mosquito.

The careful observations of great authorities on the subject undoubtedly justify us in regarding *Stegomyia fasciata*, if not as an entirely diurnal mosquito, at all events as an insect that principally bites during the daytime, be it in the tropical or temperate zone.

It is interesting in this connection to note that yellow fever is especially acquired during the night hours.

It is a well-known fact that the man who passes the night outside the infected belt of the inter-tropical zone enjoys complete immunity from the disease. Moreover, this immunity is also enjoyed by persons who pass the day in Rio de Janeiro, and return to Petropolis in the evening.

In order to establish the supposed etiological relation between *Stegomyia fasciata* and yellow fever, and taking into account that the visitors—business men chiefly—of Petropolis are in Rio de Janeiro from 10.30 a.m. to 3.30 p.m., it would be necessary to prove that *Stegomyia* is, at all events, a crepuscular mosquito.

This, however, is not the case, as we have shown, and as a matter of course this statement compromises the new etiological hypothesis. In a paper forwarded to the Director of Public Health for Brazil and which was read at the Fifth Medical Congress held in Rio de Janeiro, Drs. Simond and Marchoux sought to explain this phenomenon as follows: "The observations we have made lead us to infer that the *Stegomyia fasciata*, once infected, ceases to bite during the daytime, and bites at night only; there may possibly be exceptions, but as a rule this circumstance would explain the immunity of those persons who pass the night only outside the limits of the yellow fever boundary."

In criticising this hypothesis, we would first of all observe, that, we cannot imagine why the ingestion of blood should induce such a disturbance of the physiological functions of the *Stegomyia* as to cause it to entirely reverse one of its most important dietary characteristics. Moreover, this hypothesis is directly opposed to the above observations.

We cannot admit that all the examinations of mosquitoes could only have been upon those feeding on blood for the first time. In addition, I distinctly remember catching a number of *Stegomyiæ* in my laboratory at the yellow fever hospital of Sao Sebastiao in the middle of the day, and the microscopical examination of their digestive apparatus demonstrated the fact that they had previously sucked blood.

It is interesting to note that my laboratory in the Hospital of Sao Sebastiao was contiguous to the wards, therefore probably most of the *Stegomyiæ* caught by me had not only previously sucked blood, but were also "infected" according to the views expressed by Drs. Simond and Marchoux. The study of the *Stegomyia fasciata* in captivity teaches us that the views of Simond and Marchoux are merely theoretical.

¹ It is remarkable that, though Durham admits that yellow fever is propagated by means of mosquitoes, he does not think it possible that *Stegomyia fasciata* is the intermediary host for the germs of the disease, as it is a diurnal mosquito, but is of opinion that it is *Culex fatigans* which bites after dusk. In this connection he makes an interesting statement: "*Culex fatigans* was not very common about the yellow fever Hospital, Domingos Freire, and on the first occasion that it was met with, there was coincident with it the occurrence of a spontaneous yellow fever case; *Stegomyia fasciata*, on the other hand, was abundant there."

Dr. Durham expresses himself as follows on this subject: "In this connection it is of interest to note that all the artificial gnat infections carried out by the American Commission were done during the daytime, *Stegomyia fasciata* being the species employed."

The experiments made in the Hospital of Sao Paulo (Brazil) were also carried out during the daytime.

Observers who have had the opportunity of studying the blood-thirsty instincts of *Stegomyia fasciata* will have remarked how great is the avidity of this insect; it can easily be induced to bite during the daytime if a man or a mammal be exposed to its bite, even though it had previously sucked blood that was not yet digested.

Dr. Ficalbi mentions that one female *Culex elegans* (*Stegomyia fasciata*) cultivated in the laboratory sought to bite on the second day of its development as a mature insect. It bit on the third day and sucked itself full, and for the next three days it was occupied in digesting and passing excrement; on the fourth day after the first meal it again sucked itself full of blood, though the first meal could only have been partly digested.

Culex fatigans or *Culex pipiens* again bite in full daylight, and it is well known how difficult it is to render mosquitoes purely nocturnal.

We may therefore conclude that neither the *Stegomyia fasciata* nor the nocturnal mosquito loses the property of feeding in the day be it free or captive, after having sucked blood, whether it be healthy or "infected," according to the expression of Drs. Simond and Marchoux. If its natural avidity be augmented by a long fast it will not lose the opportunity of a meal during the daytime or any other period. It follows, therefore, that the theory of Simond and Marchoux, that seeks to explain the discrepancy between cause and effect in the new etiological theory of yellow fever, is a rare exception to the general rule, instead of a rule with but few exceptions.

